Space Weather Forecast

Issued on Friday, 15 September 2023 at 01:16 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Daily Chance of Moderate-class X-ray flares and R1 Minor Radio Blackouts. Slight Chance of Minor Geomagnetic Storm G1 at first, rising to Likely late Day 2 and then a Chance Day 3, before falling after that.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Moderate in the past 24 hours. Three Moderate-class flares of note occurred; the two largest came from a complex sunspot region close to centre disc. The third was from an energetic 'filament eruption' (arc of plasma leaving the Sun) in the northwest, close to the largest sunspot region on the facing side at present. This event has resulted in a Coronal Mass Ejection (CME), and current analysis suggests arrival sometime in the UTC afternoon/evening of Day 2 (16 Sep).

There are 8 sunspot regions on the visible disc. The largest was responsible for the CME mentioned above, but has seen some decline in the past 24 hrs, with its trailing group breaking. The next largest group is close to centre disc, and has increased in size and magnetic complexity. Other spots on the disc are generally smaller and simpler.

As mentioned above, the CME tied to the aforementioned Moderate-flare filament eruption has an expected arrival during the second half of Day 2 (16 Sep). There have been a couple of other filament disruptions on the Earth-facing disc in the past 12 hrs, with analysis pending on any earth-directed impacts.

Solar Wind / Geomagnetic Activity: Solar wind parameters were initially indicative of a descent into a slow solar wind regime, but with a notable reversal starting around 14/0300UTC, likely a increase in many measures that sometimes appears in advance of fast streams of solar wind (a CIR - Co-rotating Interacting Region).

Solar wind speeds were initially at background values, before rising more sharply to an elevated high through the UTC day. The associated magnetic field was initially at moderate levels, falling back to weak values during the morning, before recovering back to earlier values later in the day. The north-south component of the solar wind magnetic field was variable through the day, but most often northwards.

The net effect of the above solar wind measures has seen Quiet to Active geomagnetic activity (Kp2-4).

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: There is a daily Chance of Moderate-class flares, mainly from the sunspot region nearing the middle of the Sun, as well as the largest sunspot group in the northwest. The latter

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should leave the Earth-facing side over the coming UTC weekend, but the flare risk may be maintained by the return of a large region in the east, which may be the source for some large recent far-sided CMEs and, by inference, large X-ray flares.

Solar Wind / Geomagnetic Activity: A CME that left the Sun on 11 September may give a glancing blow at Earth later Day 1 into Day 2 (15-16 Sep), however, any potential effects at Earth are expected to be small if it does arrive. The CME from the Moderate-class flare filament eruption mentioned above has been analysed to arrive during the UTC afternoon/evening of Day 2 (16 Sep), with Likely G1 Minor Storm intervals (Kp5).

Coronal hole fast wind influence from CH44/+ is expected to be imminent, with speeds at Elevated levels initially, then perhaps to Strong levels by later Day 1 or Day 2 (15-16 Sep) as a second coronal hole fast wind takes over. Speeds may then begin to slowly ease to round-out the current forecast period.

In summary, Active (Kp4) intervals and a Slight Chance of G1/Minor Geomagnetic Storm (Kp5) intervals are likely to continue for the first few days under the influence of coronal holes, with a Likely risk of G1/Minor Storm intervals later Day 2 and into Day 3 (16-17 Sep) with the expected CME arrival. Into Day 4 (18 Sep) there should be a diminishing Slight Chance of G1s, with geomagnetic activity expected to fall to Quiet to Unsettled levels (Kp1-3).

Energetic Particles / Solar Radiation: There is a daily slight chance of a solar radiation storm enhancement should any larger flares occur - from the complex sunspot on the northwest of the facing side of the Sun in particular.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	60	40	10
Strong	G3	No	1	10	10	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	50	50	50	50
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	10	10	10
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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